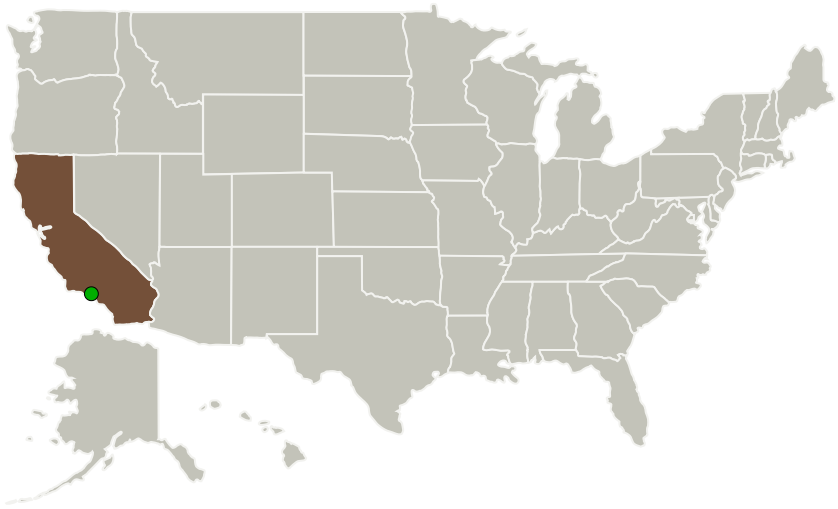
Novel Microfluidic Advances Enabling Autonomous, Long-Duration, Analysis of Nitrite/Nitrate, Phase I

Completed Technology Project (2015 - 2015)

Project Introduction

LMT proposes to develop two novel microfluidic innovations: (1) a novel long-path (250-mm), folded, on-chip absorption cell utilizing lock-in amplified detection to enable high colorimetric sensitivity; (2) a novel on-board system for mixing reagents and standards from dry chemical constituents to enable their in-situ preparation thereby enabling long-duration deployments where pre-mixed consumables would have otherwise degraded. These two innovations will enable the construction of the In-situ Nitrate/Nitrite Analyzer (INNA), a deployable microfluidic system for the continuous, autonomous, long-duration analysis of nitrate and nitrite in natural waters that will feature unprecedented sensitivity and autonomous deployment durations for this class of robust microfluidic system. INNA will be able to detect nitrate and nitrite down to single-digit nano-molar levels, making the instrument suitable for monitoring nutrients even in the oligotrophic open ocean where levels of these compounds can be below 10 nM. The system will rely upon the well-understood and widely-used colorimetric Griess assay for nitrite.

Primary U.S. Work Locations and Key Partners



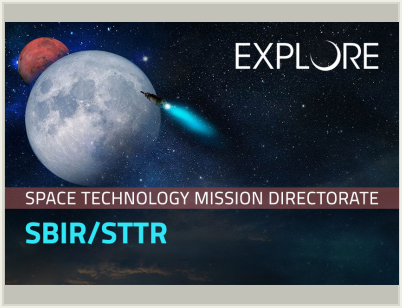


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Table of Contents

Small Business Innovation Research/Small Business Tech Transfer

Novel Microfluidic Advances Enabling Autonomous, Long-Duration, Analysis of Nitrite/Nitrate, Phase I

Completed Technology Project (2015 - 2015)

Organizations Performing Work	Role	Type	Location
Leiden Measurement Technology, LLC	Lead Organization	Industry	Sunnyvale, California
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Project Transitions

June 2015: Project Start

December 2015: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139294)*

Images

Briefing Chart
Novel Microfluidic Advances Enabling Autonomous, Long-Duration, Analysis of Nitrite/Nitrate Briefing Chart
(https://techport.nasa.gov/image/128612)

Final Summary Chart Image
Novel Microfluidic Advances Enabling Autonomous, Long-Duration, Analysis of Nitrite/Nitrate, Phase I Project Image
(https://techport.nasa.gov/image/129403)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Leiden Measurement Technology, LLC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

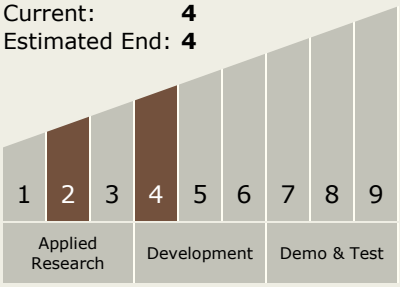
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Nathan E Bramall

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Novel Microfluidic Advances Enabling Autonomous, Long-Duration, Analysis of Nitrite/Nitrate, Phase I

Completed Technology Project (2015 - 2015)

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.3 In-Situ Instruments and Sensors
    - TX08.3.4 Environment Sensors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System